(12) UK Patent Application (19) GB (11) 2 149 202 A

(43) Application published 5 Jun 1985

(21) Application No 8427278

(22) Date of filing 29 Oct 1984

(30) Priority data
(31) 833966 (32) 28 Oct 1983 (33) FI

(51) INT CL⁴
H01J 43/08 43/28

(52) Domestic classification
H1D 15AX 17C 45A 9D 9G 9Y

(56) Documents cited
GB 1141424 GB 0898433

(58) Field of search
H1D

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(54) Photomultiplier for use in a liquid scintillation counting method

(57) A photomultiplier (10) to be used in liquid scintillation counting comprising an envelope (11a), a base (11b), an anode (12), a curved dynode structure (13) and a photocathode (14). The specimen (16) is inserted in a measuring volume (L7) in liquid scintillation counting. The surface of the photocathode (14) is concave so that the specimen (16) is as completely as possible encircled by the photocathode (14) disposed on a concave window (18), whereby a maximum number of the photons directly impinge on the photocathode (14).

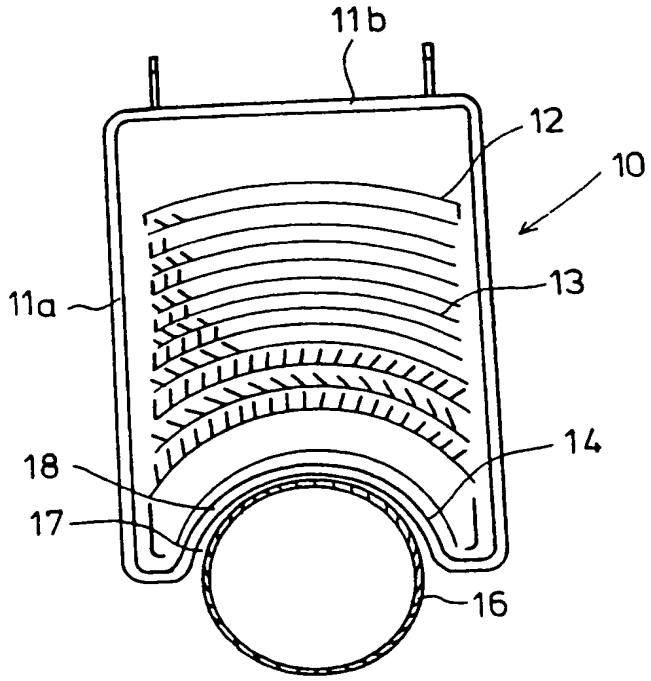

FIG.1

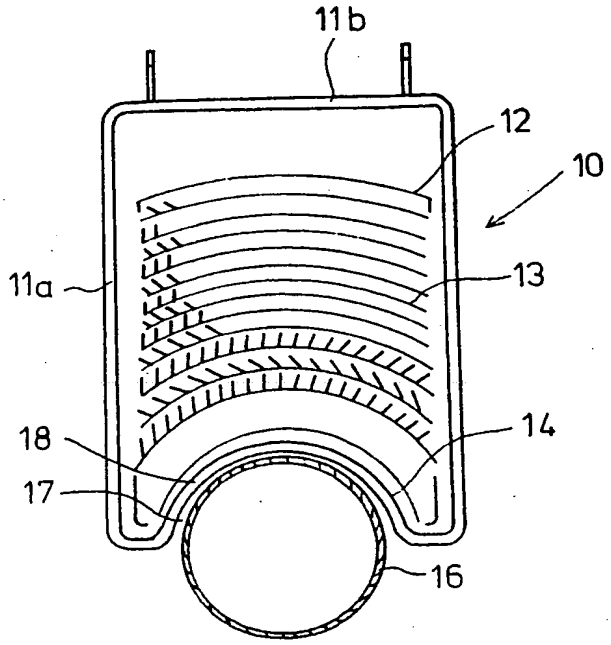

FIG.1

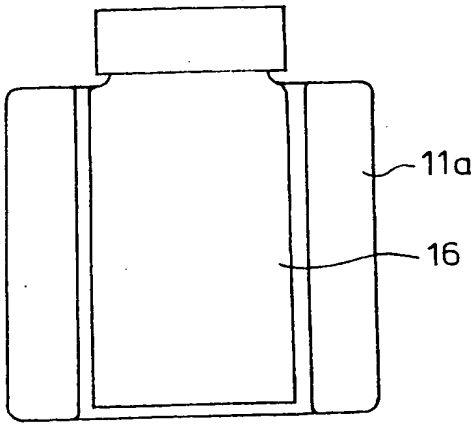

FIG.2

SPECIFICATION

Photomultiplier for use in a liquid scintillation counting method

The present invention concerns a photomultiplier for use in a liquid scintillation counting method in which a specimen is inserted in a measuring volume, comprising an envelope, a base, an anode, a dynode structure and a photocathode.

For the shape of the photocathode of the photomultiplier, two different designs are in principle currently used. The first solution is one wherein a thin and convex window is used. The drawback of this type is the convexity of the cathode surface.

The second design known in the art is one wherein a thick and straight photowindow is used, that is, the surface of the photocathode is planar. The drawback incurred with this design is that one is compelled therein to use comparatively thick glass.

It is believed possible by means of the present invention is to achieve an improvement in photomultiplier designs known currently in the art.

It is also believed possible by means of the present invention is to provide a photomultiplier in which the maximum proportion of the photons is brought directly on the photocathode and the rest of the photons can be brought on the photocathode i.e over a reflector.

According to a first aspect of the invention there is provided a photomultiplier for use in a liquid scintillation counting method in which a specimen is inserted in a measuring volume, comprising an envelope, a base, an anode, a dynode structure and a photocathode, characterized in that a photo-sensitive surface of the photocathode is concave so that the specimen can be partly encircled by the photocathode, whereby a large number of photons impinge directly on the photocathode.

The invention will be described by way of example with reference to the accompanying drawings, wherein:–

Figure 1 is a plan view of a photomultiplier embodying the invention and a sample bottle; and

Figure 2 is an elevational view corresponding to Fig. 1.

In the embodiment of Figs. 1 and 2, the photomultiplier in general is indicat d with reference numeral 10. The photomultiplier 10 comprises an envelope 11a, a base 11b, an anode 12, a curved dynode structure 13 and a photocathode 14. The reference numeral 15 indicated a focussing electrode. In Figs. 1 and 2, the sample bottle is indicated with reference numeral 16. In Fig. 1, the measuring volume is indicat d with reference numeral 17.

In accordance with the invention, th surface of the photocathode 14 is concave so that the sample bottle 16 is as completely as possible encircled by the surface of the photocathode 14. Hereby, when the photomultiplier 10 is used in liquid scintillation counting, the maximum number of photons impinge directly on the photocathode 14, and the rest of the photons are made to impinge on the photocathode 14 by using appropriate reflectors. The concave photocathode 14 is placed over a curved, i.e., concave window 18.

In Figs. 1 and 2 of the drawing, a part-cylindrical photocathode 14 is presented. The system depicted here represents one photomultiplier 10 in a system of two photomultipliers. It is obvious to a person skilled in the art that systems of three or four photomultipliers may also be produced. In such cases, the cylindrical contribution of (or angle subtended by) each photomultiplier will be less.

With this design of photomultiplier, the advantage is gained that a considerably greater proportion of the photons is brought directly on the photocathode, while the rest of the photons may be reflected onto the photocathode using appropriate reflectors.

CLAIMS

1. A photomultiplier for use in a liquid scintillation counting method in which a specimen is inserted in a measuring volume, comprising an envelope, a base, an anode, a dynode structure and a photocathode, characterized in that a photo-sensitive surface of the photocathode is concave so that the specimen can be partly encircled by the photocathode, whereby a large number of photons impinge directly on the photocathode.

2. A Photomultiplier according to claim 1, characterised in that the photocathode is disposed upon a concave window.

3. A Photomultiplier according to claim 1 or 2, characterized in that the dynode structure is a curved dynode structure.

4. A Photomultiplier according to any one of claims 1 to 3, characterized in that the photomultiplier is provided with a focussing electrode.

5. A Photomultiplier substantially as described with reference to and as illustrated in Figures of the accompanying drawings.

Printed in the United Kingdom for
Her Majesty's Stationery Office, Dd 8818935, 1985, 4235.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.